

BEFORE

THE PUBLIC SERVICE COMMISSION OF

SOUTH CAROLINA

DOCKET NO. 2021-66-A

June 11, 2021

IN RE:)	
)	
South Carolina Office of Regulatory Staff's)	
Motion to Solicit Comments from Utilities and)	INITIAL COMMENTS
Other Interested Stakeholders Regarding)	
Measures to Be Taken to Mitigate Impact of)	
Threats to Safe and Reliable Utility Service)	

I. INTRODUCTION

Central Electric Power Cooperative, Inc. (Central) is grateful for the opportunity to participate in SCPSC Docket No. 2021-66-A related to the mitigation of impacts from extreme weather events on the provision of safe and reliable electric utility service. Central provides these comments on behalf of itself and its twenty member retail electric distribution cooperatives. Because Gov. McMaster's directive focused on assessing threats from ice storms and other extreme winter weather events, our comments will address severe weather events broadly but primarily emphasize the cooperatives' proactive and reactive mechanisms to mitigate the effects of extreme winter weather.

Central's member cooperatives serve almost one-third of South Carolina's residents across all 46 South Carolina counties, as well as some of the state's largest commercial and industrial customers. Like all Americans, Central and member cooperative staff observed the February 2021 crisis in Texas with interest and concern.

Although some of the threats posed to the electric utility system in Texas are fundamentally different than those South Carolina utilities face due to differences, among others, in market structure, grid interdependence and climate, electric utilities in our state still face significant challenges in preparing for and responding to extreme winter weather events and must remain vigilant and flexible. The cooperatives' comments presented in this document focus on state- and cooperative-specific challenges and how the cooperatives have prepared and will continue to prepare to meet them.

As will be discussed in detail herein, Central receives a very substantial majority of its power and energy and network transmission service through its two principal wholesale power providers, the South Carolina Public Service Authority (Santee Cooper) and Duke Energy Carolinas, LLC (Duke). Additionally, Central contracts with Santee Cooper to maintain Central's radial transmission lines connected to Santee Cooper Balancing Authority bulk transmission system. Thus, a significant portion of Central's readiness for extreme winter weather events is a function of the rights and obligations set forth in various agreements with third-party providers.

These third-party contractual relationships are undoubtedly a very significant component of ensuring the reliability of cooperative members' retail service, but the cooperatives retain a significant amount of direct responsibility for reliability as well. New Horizon Electric Cooperative (NHEC), whose membership consists of five of Central's Upstate retail distribution cooperatives, maintains Central's radial transmission lines that are connected to Duke's bulk transmission system. And most significantly, Central's 20 members maintain their respective distribution systems to ensure reliable delivery of energy to their direct and indirect residential, commercial and industrial consumer members. These comments endeavor to address both the cooperatives' direct efforts to mitigate the effects of extreme winter weather events as well as the

structure and operation of the cooperatives indirect efforts to ensure reliability through its third-party contractual relationships.

II. **CENTRAL AND ITS SYSTEM DESCRIPTION**

A. **G&T Cooperative Model Description**

Central Electric Power Cooperative, Inc. is a not-for-profit generation and transmission (G&T) electric cooperative headquartered in Columbia, South Carolina. It was created in 1948 and is owned by its Members - the twenty distribution electric cooperatives of South Carolina. Central supplies the power needed for its Member cooperatives to serve approximately one-third of South Carolina's population through the only state-wide electric system. Central was formed with the purpose of providing wholesale power and transmission aggregation to South Carolina's cooperatives by pooling resources to meet the needs of the cooperatives in a reliable and cost-effective manner. Central and its Members have transmission and distribution lines in all forty-six counties of South Carolina. Central owns almost 800 miles of transmission lines to tie its Members into the bulk power systems of its two main power suppliers, Duke Energy Carolinas, LLC (a subsidiary of Duke Energy Corporation) and the South Carolina Public Service Authority. Central's Members own over 70,000 miles of distribution lines to provide power to over 800,000 meters. As discussed in greater detail below, Central owns community solar and peaking generator assets but obtains the substantial majority of its power through long-term purchase agreements with Santee Cooper, Duke, and the Southeastern Power Administration (SEPA).

The cooperative model involves operating "at cost" but includes accumulation of capital, called margin, to build and maintain the electrical system's infrastructure and facilities and to provide other services. All amounts received from cooperative member-owners in excess of

operating costs and expenses are considered patronage capital and are allocated to each member-owner on a cost-of-service basis. Patronage capital is returned to member-owners in accordance with each cooperative's needs and policies.

As a G&T cooperative, it is Central's responsibility to supply its twenty Members with the power needed to serve their member-owners. Central purchases this power and builds transmission lines to connect the substations serving Member cooperatives to the bulk network transmission systems. The economies of scale provided by Central enhance its Member cooperatives' ability to build their systems efficiently while minimizing costs.

B. Market Structure

The Southeast wholesale electricity market is a bilateral market that includes, among others, all of the states surrounding South Carolina. Utilities in South Carolina and the remainder of the Southeast are predominantly vertically integrated and virtually all physical wholesale electricity sales are done bilaterally through contracts governing the purchase and sale of power between the selling and purchasing entities. Transmission between the entities is generally contracted for separately. The Southeast is not served by a regional transmission organization (RTO) or an independent system operator (ISO).

For transmission reliability purposes, South Carolina falls under the Southeastern Electric Reliability Corporation (SERC) which addresses risks to reliability in all or portions of Florida, Georgia, Alabama, Mississippi, Louisiana, Texas, Oklahoma, Arkansas, Missouri, Iowa, Illinois, Kentucky, Tennessee, Virginia, North Carolina, and South Carolina; and more specifically, South Carolina falls within the VACAR (Virginia and Carolinas) subregion.

C. **Generation Supply Structure**

Central provides wholesale power to its Member cooperatives primarily through a portfolio of contracts. The two primary contracts are with Santee Cooper and Duke, which together currently supply approximately 98% of Central's Members' power needs. Central's remaining power supply resources supplement these contracts. These supplemental resources include backup generators and renewable resources such as solar and hydroelectricity. Central's Member cooperatives also receive hydroelectric capacity and energy from the Southeastern Power Administration (SEPA), an entity of the federal government. Central aggregates the power provided under these various contracts to supply the needs of its Member cooperatives. Wholesale costs are aggregated, and each Member cooperative pays the same¹ posted wholesale power rates. Member cooperatives' wholesale costs vary based on their size and member composition (for example, residential, commercial, industrial). Central manages these contracts with the objective of providing reliable power at regionally competitive wholesale costs.

The homes and businesses powered by Central's Member cooperatives are spread across the state, often in rural areas far from the network transmission lines operated by the local balancing authority. A balancing authority (BA) is an entity that has a legal responsibility for balancing load and generation within an assigned geographic territory, or its balancing authority area (BAA). Central's Member cooperatives are included in the BAAs of Santee Cooper, Duke, and Dominion Energy South Carolina (Dominion).

¹ SEPA costs are directly passed through to each Member Cooperative based on its SEPA allocation.

1. Santee Cooper Balancing Authority

Central's wholesale power contract with Santee Cooper is referred to as the Coordination Agreement which is a "bundled" contract for both generation and transmission service provided to Central with a contract end date of 2058. This "bundling" of service is allowed due to Santee Cooper's non-jurisdictional status at the Federal Energy Regulatory Commission (FERC) and the fact that amendments to the long-standing Coordination Agreement have not frustrated this legacy treatment, which is beneficial to both Central and Santee Cooper. Central currently accounts for more than 72% of Santee Cooper's firm demands. Central accounted for approximately 65% of Santee Cooper's energy sales in 2018.

The Coordination Agreement is currently an all-requirements contract, which means Santee Cooper is required to supply all of Central's energy needs in the Santee Cooper BAA. Approximately 76% of the electricity provided by Central to its Member cooperatives flows through the Coordination Agreement. Central retains options to diversify its Santee Cooper BAA wholesale power supply needs as future generation or power resource needs are required to supplement Santee Cooper's existing resources.

2. Duke Balancing Authority

Central's contract with Duke is referred to as the Duke Power Purchase Agreement (PPA). The Duke PPA is an all-requirements contract for Member cooperative load in Duke's BAA. The Duke PPA is a more traditional PPA, covering only the purchase of wholesale power and with a contract term through 2030. The PPA is regulated by FERC under a cost-based tariff, and the PPA's terms and rates structure align with FERC's cost-based rate formula methodology.

Central has a separate contract with Duke, called a Network Integration Transmission Service Agreement (NITSA), for transmission services. The NITSA requires Duke to serve all Central delivery points connected to Duke's transmission system as network load, with no adverse distinction between Central's delivery points and Duke's retail loads. The NITSA remains in effect for as long as Duke provides transmission services as a balancing authority and is independent of the PPA term.

3. Reliance on Suppliers

Central receives 98% of its power from Santee Cooper and Duke, and 100% of its bulk transmission service from Santee Cooper, Duke, and Dominion. Due to these contractual relationships, Central is dependent upon and expects that these upstream suppliers take the necessary planning, operational, and delivery actions to ensure reliability of service for electricity delivered to cooperative delivery points, most importantly during periods of peak demand experienced during extreme winter weather conditions. Central and its Member cooperatives meet frequently with these suppliers to discuss reliability matters and concerns and to ensure that appropriate planning and resolution to vulnerabilities are addressed. It is, however, the responsibility and obligation of these suppliers to remedy vulnerabilities and ensure Central Member cooperatives receive the reliable delivery of power at all times, especially in extreme winter weather conditions.

4. Other Power Supply Sources

In addition to the two main power supply contracts, a small minority of Central's wholesale power is secured through several other sources as described below:

A) SEPA

SEPA is a federal power marketing administrator that provides low-cost power from hydroelectric dams on the Thurmond, Russell, and Hartwell reservoirs operated by the U. S. Army Corps of Engineers on the Savannah River. The power is sold to electric cooperatives and municipal utilities in the Southeast, including all 20 of Central's Members.

SEPA's power entitlements belong to Central's Members, and SEPA is obligated to provide capacity to Member cooperatives. That capacity is referred to as each cooperative's SEPA allocation; however, the PPAs are contracted directly between SEPA and Central. Central acts as the Member cooperatives' agent, managing the contracts and ensuring that the power benefits the Member cooperatives. SEPA's costs are directly passed through to each Member cooperative based on its SEPA allocation. SEPA currently supplies 200 MW of capacity and associated energy to Central's Member cooperatives.

B) Renewables

Central's PPAs with Santee Cooper and Duke include limitations on the ability of Central and its Member cooperatives to build renewable generation, or any type of generation, without incurring penalties. Central and its Member cooperatives are assisting commercial, industrial and residential member-owners throughout the state to access renewable options that meet their needs and benefit the system while minimizing any penalties assessed to Central.

Central operates and maintains a fleet of community solar facilities comprised of 29 individual facilities ranging in size from 60 kW AC to 250 kW AC. These solar facilities are interconnected directly to Cooperative distribution systems. Community Solar nameplate capacity totals 4.2 MW AC/5.6 MW DC. Central also contracts for the output from one 6.5 MW AC (8

MW DC) facility directly interconnected onto a cooperative distribution system for the benefit of a Cooperative industrial member-owner.

Under the Public Utility Regulatory Policies Act of 1978 (PURPA), Central and other utilities must contract with a third-party renewable developer if a project meets the PURPA criteria to be a Qualifying Facility (QF) and if the offer price is less than or equal to the utility's avoided energy cost. This avoided energy cost is specific to each utility but represents the production costs a utility avoids by purchasing energy from the QF provider. Both Santee Cooper's and Duke's contracts with Central acknowledge and account for PURPA-required purchases. Central can transact with these PURPA suppliers, and such purchases reduce Central's energy purchases from Santee Cooper and Duke without financial penalties.

While solar power provides valuable low-cost energy to Central and its Member cooperatives, solar power's inherently intermittent production profile prevents it from significantly reducing Central's capacity needs. The winter peak occurs early in the morning when solar irradiance is low, so solar production is minimal at the time of the winter peak. Solar facilities typically are producing power during summer peak hours, but Central's summer peak typically occurs as the sun is beginning to set, reducing the capacity value of solar generating facilities.

C) Diesel Generators

Central purchased six 3 MW diesel generators from Santee Cooper in 2012. Four of the generators are used by Central to reduce Duke's annual coincident peak. The other two generators are connected to Dominion transmission and are used as backup generation for Member cooperatives. These generators have undergone substantial environmental compliance upgrades, meet current environmental emission standards, and are RICE-NESHAP compliant. Their quick-

start capabilities and high ramp rates make these generators effective peak-shaving resources. Duke holds a call option for the diesel generators when system conditions require, and generators co-located with an industry are designed to start automatically when the industry loses power from the grid. These generators remain on remote peak/standby except when taken out of service for an outage.

D. Transmission

From Central's perspective, the transmission grid consists of two pieces: bulk transmission lines and radial transmission lines. The bulk transmission grid is a larger network of lines that typically operate at higher voltages and are owned and operated by Balancing Authorities, in Central's case, Santee Cooper, Duke, and Dominion. These lines transmit the power Central purchases from the generation resources to Central's radial transmission lines. Radial transmission lines are built and owned by Central and are utilized to interconnect Central's Member-owned substations to the respective balancing authority bulk transmission grid. Central's board approves construction workplans, which identify all needed radial transmission investments. The current board-approved transmission construction work plan for the 2019-2022 period includes 35 projects with a projected budget of \$163.5 million.

Just as with the generation portion of the electric supply chain, Central is reliant upon Santee Cooper, Duke and Dominion to adequately maintain, operate, plan for and upgrade the bulk transmission grid to ensure reliability of power delivery.

As for the Central-owned radial transmission lines, Central contracts for routine service from Santee Cooper (for the portion of the radial lines connected to Santee Cooper's bulk transmission lines) and New Horizon Electric Cooperative (for the portion of the radial lines connected to Duke's bulk transmission lines) and to respond, repair, and restore service following

a utility service disruption. NHEC coordinates with Duke when outages are on the Duke bulk transmission system. When imminent severe weather is identified, Central personnel communicate with these operation and maintenance (O&M) providers to confirm readiness status and to communicate any available construction resources that may be available for use in an emergency. Both Santee Cooper and NHEC are charged with the total responsibility for electric service restoration, to include obtaining, maintaining, participating, and utilizing mutual aid agreements with other entities that have the ability to provide the appropriate equipment and manpower necessary for transmission service restoration. In general, Central's transmission assets are serving radial loads and are adequately sized for current loading.

Central's radial transmission service to Member delivery points typically runs from a designated tap point on the Santee Cooper, Duke, or Dominion bulk system to the high side termination point within the Member's substation. Central does not own, operate, or maintain any Member-owned substation equipment.

E. Distribution

The twenty distribution cooperatives of South Carolina are served by Central through all-requirements contracts to deliver safe, reliable, and affordable power to over 1.5 million South Carolinians in all 46 counties of the state. The distribution cooperatives take service from Central at the low side termination point of their substations that they own and operate. The 5 upstate cooperatives served by Duke bulk transmission own NHEC, which is responsible for constructing, maintaining, and owning their substations. The remaining 15 Central Member cooperatives are served by the Santee Cooper bulk transmission system and are responsible for construction and maintenance of their owned substations. Each of the 20 distribution cooperatives construct, own, and maintain all distribution facilities to serve their retail members, including feeders,

transformation, and metering. Each cooperative is also responsible for all other aspects of service to its retail members, such as retail billing and consumer programs, and take direction from its locally elected boards of trustees.

The Electric Cooperatives of South Carolina (ECSC) is a statewide service and trade association for cooperatives in the state. ECSC provides member cooperatives a variety of services, including personnel training, safety programs, and emergency storm restoration coordination, as well as government relations and marketing. ECSC serves as the central point of coordination during emergency storm events acting as the information “hub” between local cooperatives, Central, emergency agencies, and regional and national cooperative organizations that provide critical ground support during reliability events. Central works closely with ECSC to ensure that the cooperatives and the Member-Owners have the resources they need to restore service safely and expeditiously to consumers during storm and extreme weather-related events.

III. **THREATS TO UTILITY SERVICE**

Central’s Emergency Action Plans, forecasting, and system planning take into consideration many different causes of large-scale outages, including major storms or natural disasters, extreme warm or cold weather, cybersecurity attacks, physical attacks, telecommunication disruption, labor force disruption (such as pandemics), and equipment failure. In accordance with Office of Regulatory Staff guidance, this report will specifically address ice storms and winter weather conditions.

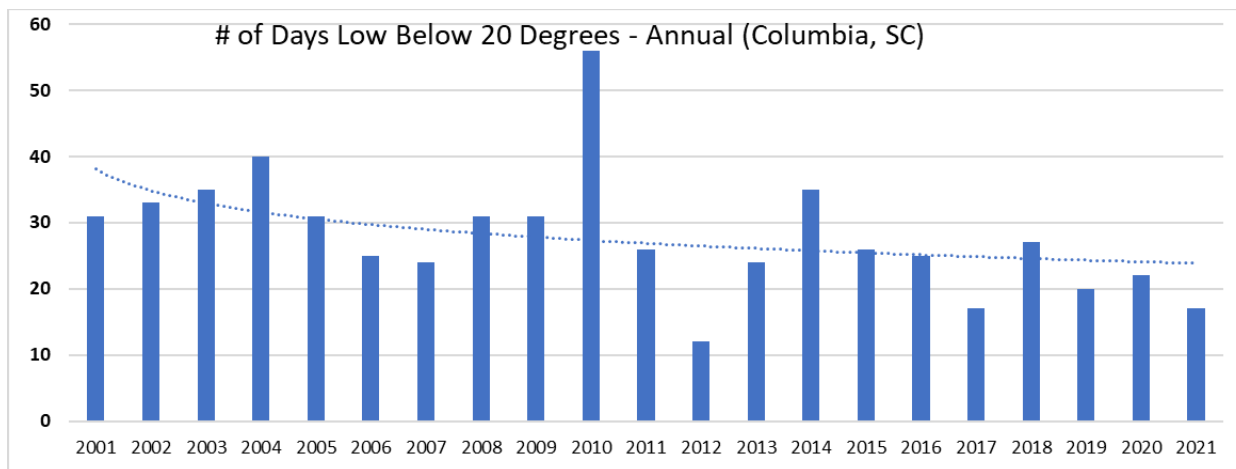
Central defines Winter Weather Threats that may destroy, damage, or disrupt utility service as follows:

- *Ice/Snowstorms – Uncommon precipitation that diminishes or breaks system components that are necessary for meeting consumer demand.*
- *Excessive Cold Acute – A series of hours whereby a combination of peak demand or lost system capability exceed facility ratings due to the excessive cold and that threaten the system’s ability to meet the demand of consumers.*
- *Excessive Cold Duration – A period of time when temperatures stay low enough to produce a continuous strain on system resources whereby traditional peaking capabilities lack the necessary endurance to meet consumer demand.*

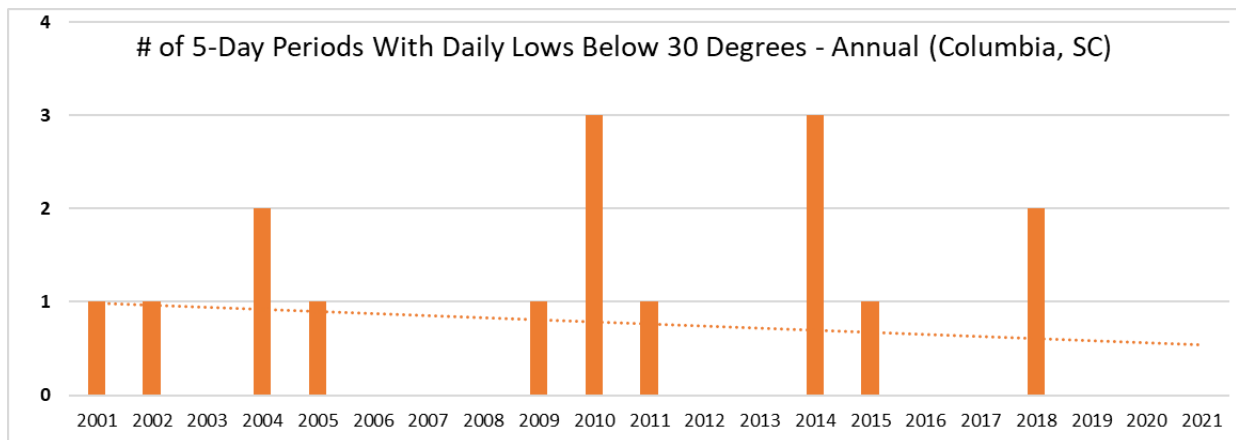
IV. **IMPACTS TO UTILITY SERVICE**

- **Ice/Snowstorms** – Although ice/snowstorms can occur in South Carolina, they do so only occasionally. However, when these events do occur, they can impact all aspects of power supply including generation, transmission, and distribution.
- **Excessive Cold Acute** - While it is not uncommon for South Carolina to experience bouts of relatively cold weather for the area, over the past 20 years, there were only 10 days in Columbia where the recorded low was below 10 Degrees. Provided power is supplied to Central’s transmission lines, short-duration extreme cold events are not expected to have a materially detrimental effect on power supply, transmission, or distribution. The chart below indicates the annual number of days in Columbia, SC with a low temperature below 20 degrees.²

² Data for Columbia Metropolitan Airport at <https://www.ncdc.noaa.gov/cdo-web/search>.



- Excessive Cold Duration** - Systems that can withstand short periods of cold weather are not necessarily equipped to sustain operation or function over long periods of cold weather. The graph below indicates how often over the past 20 years that Columbia, South Carolina has experienced a 5-day period with lows that consistently fall below 30 degrees. Over the past 20 years, Columbia experienced only two 5-day events in which the daily low temperature was consistently below 20 degrees, once in 2010 and once in 2018. However, these occasional events can have a significant effect on all aspects of power supply and delivery.³



³ Data for Columbia Metropolitan Airport at <https://www.ncdc.noaa.gov/cdo-web/search>.

V. ASSESSMENT OF VULNERABILITIES

A. Power Supply

The vast majority of power utilized to serve Central's Members are provided by Santee Cooper, Duke, and Dominion through contractual arrangements. Central is reliant upon these entities for service and therefore expects them to address power supply resource vulnerabilities within their responses in this docket.

- Physical Generation – Central-owned generation resources are not a significant concern due to their extremely limited contribution to Central's supply; however, the vulnerabilities applicable to Santee Cooper's and Duke's physical generation resources are vulnerabilities to Central's wholesale power supply. Such vulnerabilities include, but are not limited to, instrumentation, process systems, and fuel supplies, including natural gas and coal piles, as well as intermittency of solar generation.
- Difficulty in balancing generation resources through timeframes in which load has significant fluctuation due to loss and recovery of system resources, whether transmission or generation.
- Limited import capability (~650 to 800 MWs cited as Santee Cooper availability during winter peak) – South Carolina, and specifically the Santee Cooper BAA, has a limited import capability and therefore cannot rely on large emergency power imports or reserve sharing to pick up significant volumes of load due to loss of widespread fuel supplies or other generator outages.
- Supply Chain Disruptions

B. Transmission

The bulk transmission utilized by Central is provided by Santee Cooper, Duke, and Dominion through contractual arrangements, and although there may be vulnerabilities that need to be identified with the bulk transmission grid, Central is reliant upon these entities for service and therefore expects them to address vulnerabilities to the bulk transmission grid within their responses in this docket.

Central works with their radial transmission O&M providers (Santee Cooper and NHEC) to assess transmission system vulnerabilities and weaknesses associated with Central's radial transmission lines. These providers are expected to remedy, minimize, and/or eliminate known concerns. Central performs a pre-event review with O&M providers to ensure readiness for an impending threat.

There are a number of potential vulnerabilities associated with these assets, most of which are not uncommon to other segments of the transmission-specific portion of the supply chain. Specifically, the following have been identified specific to Central's radial lines.

- Limited excess capacity or diminished capacity due to loss of lines decreases ability to import power from off-system sources that are counted upon to meet system demand. Limited excess capacity due to loss of lines is the responsibility of the BAA operators. Central's owned, radial transmission system is not relied upon to import power from interconnections to other utilities. If capacity is available, Central's radial lines are able to carry the load they were designed to serve.

- Unavailability of employees, contractors, or human resources necessary to resolve issues due to road conditions and other threats: Prior to an anticipated weather event, Central confirms the readiness of its O&M providers to respond to any emergency.
- Replacement materials such as transformers, mobile substations, conductors, specialty items: Access to and availability of materials amidst surge in demand during widespread catastrophic issues. For Central-owned transmission substations, Central maintains either spare power transformers or installs redundant capacity to ensure the load can be carried/served in the event of a power transformer failure.

C. **Cooperative Distribution Systems**

The distribution system is dependent on the transmission system and is vulnerable to the same risks. Overhead distribution facilities, which are prevalent in rural areas, are not designed to carry the excess weight that snow and ice can bring, and can be further threatened by timber that is brought down by snow, ice, and wind. Distribution cooperatives rely on internal personnel, contractors, and other utilities to assess distribution system vulnerabilities and weaknesses, and to properly maintain distribution rights-of-way (ROWs) to reduce the risk of trees and other objects from coming into contact with or damaging facilities. The distribution cooperatives conduct training exercises to ensure all personnel are prepared to respond to a restoration event. Nonetheless, vulnerabilities can include:

- Unavailability of employees, contractors, or human resources necessary to resolve issues due to road conditions and other threats.
- Replacement materials – conductors, transformers, specialty items. Access to and availability of materials amidst surge in demand during widespread catastrophic issues.

- Long radial feeders with limited tie capability.
- Aging system components such as poles and copper conductors.
- Limited substation capacity (power transformers, voltage regulators).
- Lack of tie points for backfeed for loss of primary source (N-1 contingency/single component outage).
- Limitations on construction contractors and mutual aid crews during severe outage events, especially when natural disasters happen across widespread areas or when multiple weather events happen within a short period of time.

VI. ASSESSMENT OF RISKS

A. Power Supply

It is obvious that a disruption in power supply would impact Central's ability to meet the electric load requirements of its Member cooperatives and those Members' consumers. To the extent that resources are lost due to weather conditions, supply chain issues disrupt fuel sources, and load is not thoughtfully curtailed, Central and its Member cooperatives could be significantly impacted. Central is relying on and expecting Santee Cooper and Duke to address this segment of the supply chain.

B. Transmission

As previously explained, the bulk transmission grid is the responsibility of Santee Cooper, Duke, and Dominion. While extreme winter weather can have an impact on the transmission grid's capability, it is typically not materially harmed by purely temperature-related challenges. However, ice, freezing precipitation, and other related issues can create significant harm to the

transmission system and its capability to deliver energy to users, including Central. Central is relying upon Santee Cooper, Duke and Dominion to address their transmission systems from a risk perspective.

Although the bulk transmission system operator is responsible for delivering energy to Central's system, the risk related to Central's radial transmission system in an extreme winter weather event is the inability to deliver a safe and effective restoration effort through its O&M providers (Santee Cooper and NHEC). Both O&M providers own and maintain equipment and employ technical resources to restore ordinary and minor widespread damage from weather events. Santee Cooper also has active mutual assistance agreements (through American Public Power Association and others) in place and structures their construction contracts such that contract resources must request a release before they can leave the Santee Cooper system. NHEC has a mutual assistance agreement with Santee Cooper and the National Rural Electric Cooperative Association (NRECA). Central employs language with construction contractors such that contract resources must request a release before they can leave the Central system. NHEC does not employ transmission contract resources and as such, does not maintain leverage on contract resources.

Significant winter weather can impact pole hardware and wood pole structures. The potential for damage is mainly to conductors, associated pole hardware, and wood pole structures. Santee Cooper maintains adequate inventory for repairs to these at-risk items. NHEC and Central utilize Cooperative Electric Energy Utility Supply, Inc. (CEEUS) to source the most commonly used pole hardware for damage incurred in the Duke BA area of Central's system, and Central maintains a pole inventory in various locations within the state to supply replacement steel poles for any structures damaged. Additionally, Central can access poles that are currently in the field for new construction. These inventories help mitigate the pole supply risk during a storm event.

C. Cooperative Distribution System

A significant winter storm can have a major impact on overhead distribution facilities, resulting in outages for Member consumers. Risks include the following:

- Loss of backbone feeders due to an ice storm is a major concern, as the ability to backfeed between substations would be limited.
- Increased electric heat load could strain substation capacity, especially when a feeder or source substation is lost during a single-contingency outage (backfeeding backbone circuits between substations).
- Access issues become a concern during winter storm events (slippery conditions hamper restoration efforts). Access issues can be magnified where physical assets are in difficult-to-reach locations such as sloped terrain in the Upstate and swamp conditions in the Lowcountry.
- Danger trees outside of the ROW can fall during a winter weather event causing widespread outages on backbones and taps (again, slippery conditions make clearing these trees and restoring service more difficult). When properly maintained, tree risk should be somewhat limited. Ice/snow can bring down trees that were not previously defined as danger trees, especially in regions of the state that have significant changes in elevation.

VII. RESILIENCY SOLUTIONS

A. Solutions

1. Power Supply

As referenced above, Central is dependent upon Santee Cooper and Duke, through its power supply contracts, to assure resilient and reliable power supply. Central's wholesale power contracts are for firm (non-interruptible) supply on a level equivalent to the suppliers' own retail loads. This means both suppliers plan on a long-term basis to continuously sell power to Central and to have sufficient reserve resources available to meet applicable reliability standards.

2. Transmission

The bulk transmission grid is the responsibility of Santee Cooper, Duke, and Dominion; therefore, Central is relying upon these entities to address existing and future resiliency measures for their bulk transmission systems.

Central's current radial transmission line design and construction is robust and capable of handling most ice storm events. However, older transmission line design and construction methods are not to the current standards and are more likely to fail. In particular, older wooden structures and post insulators could fail during an extreme ice storm event.

Measures that could be taken and are being taken when opportunities arise:

- Replacement of tangent post with brace post insulators
- Replacement of dead-end and tangent structures (poles)
- Additional structures within long spans

- Anchor additions and holding strength verification
- Complete rebuild to current standards
- Additional right of way maintenance and danger tree removal

Load current flows on the phase conductors and, during a winter weather event, generates heat because of losses due to conductor resistance. This tends to repel the formation of ice on the phase conductors. Ice accumulates more readily on the overhead static conductor due to only neutral currents flowing on this conductor. It therefore has a greater tendency to sag under the weight of ice accumulation and also can break. Sufficient midspan clearance between the overhead static conductor and the phase conductors must be maintained for this condition. When ice does accumulate on conductors, it will not typically break off of all the conductors at the same time. As such, design of sufficient horizontal separation to avoid ice jumping contact is employed.

- If staggered framing isn't an option, an increase to the vertical spacing between conductors or shortened spans to reduce the sag differential may be appropriate.
- Ice accumulation on wires can cause conductor galloping, so galloping clearances need to be maintained in areas that are commonly subjected to icing events or galloping ellipse magnitude needs to be reduced using items such as air flow spoilers.
- For hilly areas, where there are commonly significant elevation differences and varying span lengths, finite element analysis needs to be performed for unbalanced longitudinal loading that is frequently unaccounted for in ruling span designs.
- Danger tree maintenance is of greater importance for lines in narrow rights of way, where the lines do not have sufficient fall radius protection.

3. Co-op Distribution System

Current distribution line design and construction is robust and capable of handling most ice storm events. However, older distribution line design and construction methods are not to the current standards and could be more likely to fail.

Measures that could be taken and are being taken when opportunities arise:

- Upgrade older designs to comply with current design standards and specifications.
- Continue to implement AMI metering systems to better identify location of outages and reduce response times.
- Modernize substations and switching stations to allow for providing service to sections of load where service has been restored.
- At existing substations, power transformers and voltage regulator upgrades should be investigated once peak load gets to 80%. Increase capacity or add additional power transformers. Also, convert from bus regulation to feeder regulation to help with capacity limitations and provide greater regulation flexibility.
- Upgrade feeder circuits
 - Identify critical distribution feeders and harden these facilities to reduce damage and improve restoration times.
 - Storm hardening should start with backbone feeders. Also, consideration should be given to undergrounding overhead services. Even after the system is restored, some member-consumers cannot accept service due to downed weatherhead or issues with meter base. An electrician must be procured to fix these conditions before the

electric cooperative can restore service. Consider burial of the service spans to mitigate this delay in restoring service, recognizing that even with undergrounding, damage to meter bases can still be a concern.

- Add additional tie points between feeders. May require converting 1ph to 3ph and increasing size of conductors.
- Additional access to mobile substations can provide temporary restoration to a section of the system while allowing restoration efforts to continue.
- In the future, batteries and other new or alternative technologies may become a viable option for backup power, although current wholesale power contracts will require amendments to minimize penalties that currently exist.
- Backup for priority facilities such as hospitals
 - Consumers have the ability to self-identify as critical, and generally must provide documentation (e.g., medical equipment that is required and needs power). Given that cooperatives are generally weighted toward residential, consumers with critical needs are spread throughout the service territory, limiting a cooperative's ability to "prioritize" their restoration. Instead, this service becomes part of the pre-storm planning where consumers are notified that a storm is coming that could result in a longer term power outage, and to please make arrangements. In some cases the cooperative will help coordinate transportation for these member-consumers.
 - Distributed generation locally installed back-up generators, potentially arranged within a microgrid are or will become viable considerations for critical facilities
- Overcurrent protection and Sectionalizing

- Install Self-healing Schemes/FLISR (fault location, isolation, and service restoration) scheme deployment. While this is a solution, there is a limited opportunity for deployment currently due to limits on technology on existing system and due to the cost/density relationship.
- Install additional switching locations and intelligent electronic devices to allow for better switching capability.
- Construct new substations or primary delivery points.
- Create new tie lines, increase switching capabilities for N-1 (single component outage) contingencies.
- Storm hardening
 - Strengthen tie lines by reconductoring to larger conductor.
 - Ensuring access to critical infrastructure on the ROW. This can mean relocating critical poles along the roadway instead of having tree lines on each side.
 - Backbone hardening on main lines. Hardening is limited due to cost, terrain, and other factors. As it relates to ice/snow, hardening can mean replacing hardened wood poles with softer poles that allow more flex when weighted and are easier to climb during restoration.
 - Burial of overhead services and policies requiring new services be underground - Limited to certain portions of the system due to cost and consumer density. Would be standard practice in most cases for serving a new residential sub-division or in other more densely populated portions of the service territory.

- Some cooperatives that serve more urban areas do take advantage of burying underground facilities to improve storm related reliability.
- Capacity upgrades
 - Increase line ampacity through reconductoring
 - Single-phase to three-phase line conversion
 - Increase substation capacity for power transformers and voltage regulators
- Supervisory Control and Data Acquisition (SCADA) system installation for monitoring and control
- System optimization including volt/var management

B. Impact to Rate Payers

1. Power Supply

Central's wholesale power supply contracts are cost-based, meaning Central's wholesale power costs are directly tied to their suppliers' costs. On a pro rata basis, Central (and therefore Central's Member cooperatives and their consumers), would pay the costs of any storm response measures and resiliency upgrades implemented by Santee Cooper and Duke. If inadequate fuel supplies were procured prior to extreme weather events or fuel costs were not fully hedged, price spikes during extreme weather events will increase these system costs beyond costs incurred during normal weather conditions.

2. Transmission

Just as with power supply costs, the cost of storm response and any bulk transmission upgrades would be passed through from Central's providers to Central and then to Central's Member cooperatives and each of the Members' consumers.

With regard to Central's radial transmission lines, storm costs and any upgrades are paid for on a pro rata basis by Central's Member cooperatives and then passed onto the Members' consumers.

3. Cooperative Distribution System

Just like Central, the distribution cooperatives are not-for-profit entities; because they have no profit margin, all costs are socialized across the cooperative membership and are recovered from member-consumers. In the case of significant weather events, government funds can become available, primarily through the Federal Emergency Management Agency (FEMA), so the cooperatives are careful to track storm response event costs for possible reimbursement.

In addition, the following activities are conducted by the distribution cooperatives to minimize costs to consumers:

- Preparations help reduce outage times and thus financial impacts on member-consumers.
- Planning, training, and following proper procurement practices help position distribution cooperatives to receive state and federal support (FEMA) for costs related to major storms. Planning helps speed receipt of financial aid, as well as ensure eligibility.
- Normal processes to monitor costs ensure contractors and external support do not charge excessive rates during an emergency. This is also required by FEMA to be eligible for

financial support following a major event. The Electric Cooperatives of South Carolina, Inc. (ECSC) Mutual Aid Agreement defines costs and dictates rates, in addition to existing cooperative contracts with vendors. Finance and/or operations personnel monitor activity during extreme weather events.

- Installation of resiliency measures increase costs in the short term but the reward is faster service restoration after a major storm event.

VIII. IDENTIFICATION OF FEDERAL AND STATE RELIABILITY REQUIREMENTS

Federal, state, and local reliability and resilience requirements applicable to Central include:

- Rural Utility Service (RUS) Reliability Standards
- North American Electric Reliability Corporation (NERC) Reliability Standards
- National Electric Safety Code (NESC) Construction Standards
- VACAR South Reliability Agreement
- VACAR Reserve Sharing Group
- Regional Equipment Sharing for Transmission Outage Restoration (RESTORE)
- South Carolina Regional Transmission Planning (SCRTP)
- SERC, NTSG, and LTSG Reliability Assessment Studies
- Eastern Interconnection Planning Collaborative (EIPC)

- Carolinas Transmission Coordination Arrangement

Cooperatives are subject to requirements published by assorted organizations, such as Rural Utility Services (RUS) and National Electric Safety Code (NESC). These organizations have requirements for all facets of distribution service, including reliability, operations and maintenance practices, and construction standards.

Perhaps one of the best indicators of reliability of service, and one measured consistently throughout the industry, is “average outage time per consumer,” as measured by the System Average Interruption Duration Index (SAIDI). The RUS standard for average outage time per consumer, as measured by the SAIDI index, is 200 minutes, per RUS Bulletin 1730A-119 (excluding Power Supply, Major Event, and Planned outages). Central and its Member cooperatives consistently perform exceptionally according to this standard with an annual SAIDI average of less than 20 minutes per year.

The cooperatives must also construct their systems in accordance with National Electric Safety Code requirements, including required inspections and maintenance programs, in order to maintain funding.

IX. CURRENT PROCESSES AND SYSTEMS (MITIGATION)

Central has extensive, well-thought-out emergency response processes for maintaining service continuity. Central utilizes the services of its O&M providers to supply the basic human services for workers supporting restoration on Central’s system. In the Santee Cooper BAA, Santee Cooper performs this service. In the Duke BAA, NHEC performs this service. In addition, Central stands ready to provide support as needed.

A. Power Supply

- Regular interactions with Duke, Santee Cooper, and other Regional Utilities
- Resource Sharing
- Curtailment protocols
- Santee Cooper and Duke engage in hedge strategies for a portion of their fuel resources
- Reserve Capacity Management
- Santee Cooper performs a winter seasonal assessment each year to stress test the system for extreme loading event. Through this process, mitigation plans are developed, reviewed, and published.

B. Transmission

In general, Central's transmission system is maintained regularly through several inspection methodologies to ensure risks are found and mitigated. These inspections are the responsibility of Central's O&M providers and include, but are not limited to: aerial via helicopter, drone, motorized patrols, and foot patrols. As deficiencies are found, they are categorized and remedied based upon the severity of the issue found. Immediate threat to life and public safety takes the highest priority, with how severe the system could be impacted by the risk being the next major factor determining the schedule for remedying a risk.

- Mutual Aid – Central has placed mutual aid responsibilities on their O&M Providers. Central is aware of the various agreements in place for both providers and monitors the use of such agreements following a threat that has impacted Central's system.

- Emergency Action Plan – Central reviews the O&M providers’ emergency action plans and will participate in tabletop exercises to ensure the O&M providers are prepared for threats.
- Construction Work Plans – Resiliency Enhancements, Load Capacity, etc. – Central has included in its previous and current work plans projects that improve reliability, resiliency, and load capacity. Central transmission planning conducts joint planning meetings with bulk transmission providers, O&M providers, and Members to ensure risks are understood across the various companies.
- Planning studies – SERC Near-Term, Long-Term, Short Circuit, and Dynamic working groups perform a variety of system studies and analysis annually. Central’s transmission assets are incorporated into data brought to these working groups by the respective SERC working group participants for Transmission Planning. Additionally, Central works directly with Santee Cooper to perform routine system analysis and NERC TPL-001-4 transmission assessments. The purpose of above mentioned and other unmentioned efforts is to demonstrate compliance with the respective Electric Reliability Organization and ensure transmission reliability.
- Staging of housing and other life support functions to assure availability of human resources is performed by Central’s O&M providers.
- Staging of critical replacement materials – utilization of supply and material network sharing. Central maintains an inventory of standard steel poles and utilizes CEE-US for standard pole hardware and conductor repair materials. Central also utilizes the same

design standards as Santee Cooper and therefore can capitalize on that strategic relationship to ensure material availability.

- Routine ROW audits are conducted to ensure services are provided in accordance with Central's O&M providers contractual requirements.

C. **Cooperative Distribution System**

South Carolina cooperatives place a great emphasis on planning and preparation for events that may arise. As weather events become increasingly extreme, the need for disaster planning and preparation is greatly heightened. Cooperatives engage in 24/7 weather monitoring and disaster preparation.

Distribution cooperatives dedicate a significant amount of time and resources throughout the year to ensure ROW is maintained and facilities are inspected to reduce the risks of long-term outages related to a major weather event. Critical facilities are identified to ensure that in the event of a significant outage, restoration to these areas is prioritized.

South Carolina cooperatives utilize the following tools and resources to prepare for and respond to major events:

1. **Mutual Aid Plans**

ECSC helps its members by coordinating mutual assistance to restore power when disasters strike, including hurricanes, ice storms, tornados, and other extreme weather events. In the last five years, the state's cooperatives have experienced major outages from numerous weather events, including Hurricanes Matthew, Irma, Florence, Dorian, Isaias, and Zeta, all of which required ECSC to coordinate mutual assistance. In total during this period, the Loss Control and Training

(LCT) staff at ECSC has facilitated the movement of more than 1500 line workers from 170 different electric cooperatives from Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Louisiana, Arkansas, and Missouri. During coordination efforts, ECSC's goal is to allocate all available resources to affected electric cooperatives in a safe, efficient, and economically feasible manner. In order for the LCT staff to accomplish this goal during major weather events, we must take a proactive approach and effectively communicate with all involved parties.

When extreme weather hits, LCT staff works from a written set of procedures. Each team member plays a specific role in the process, consisting of 1) a coordination manager, 2) ECSC points of contact for each South Carolina electric cooperative, and 3) an emergency management liaison. The coordination manager tracks weather events, monitors electric distribution outages, sets up conference calls, oversees all crew movements, maintains records, communicates with other states' cooperative associations, and allocates personnel based on needs, availability, and location.

ECSC points of contact communicate directly with their predetermined list of state electric cooperatives. They gather information on mutual assistance needs and availability and deliver this information to the coordination manager. They also ensure that each cooperative has all of its necessary paperwork filled out or available to distribute to the necessary party. This paperwork includes items such as crew rosters and transportation waivers. The emergency management liaison facilitates communication between cooperatives, the South Carolina Emergency Management Division (SCEMD), and other state agencies. The liaison also coordinates requests for assistance between cooperatives and state agencies, as well as damage requests and reporting between SCEMD and the Federal Emergency Management Agency (FEMA). Because the LCT

team has established roles and responsibilities, we can proactively approach each weather event without chaos and confusion.

Effective communication is probably the most critical part of the process. Failure to communicate among ourselves, with the cooperatives, or with other state associations, can break a link in our process chain, and it can create more stress on an already stressful situation. This is one reason that each team member communicates with specific, pre-determined individuals. By limiting the communication responsibilities for each team member, the chance of a broken link in our process chain is minimized, the probability of a successful coordination effort is increased, the added stress is removed from an already stressful situation, and the likelihood of power being restored earlier at each electric cooperative is improved. Even so, with each challenge, an opportunity presents itself for improvement. After every extreme weather event, we conduct an analysis to identify any potential areas of improvement. We continuously look for those challenges to improve our process.

2. Proactive Maintenance and Inspection Programs

Cooperatives prepare and utilize proactive maintenance programs, as required by RUS and good utility practice. The cooperatives believe that regular and consistent maintenance, inspections, and testing of components of their electric distribution system and other support systems is one of the most beneficial means of maintaining and providing highly reliable electric service to their members. The cooperative staffs consist of experienced and technically trained personnel who continuously update and refine procedures for operating and maintaining equipment and resources to meet or exceed the needs of their consumer-members. The goals of these programs are “standardization,” “automation,” and “modernization.”

These maintenance and inspection programs include:

- Operation and Maintenance Plans for specific equipment
- Infrared Inspections
- System Inspection (Poles, Wires, Substations, Etc.)
- Vegetation Management (Right-of-Way) Plans

3. Emergency Action Planning

The SC electric cooperatives maintain formal Emergency Action Plans to guide their efforts and processes in the event of disasters. The purpose of these plans is to establish an order of response by cooperative personnel in the case of natural or unnatural disasters which disrupt a major portion of the distribution grid. Through the use of established chain of command, as well as resource capabilities, the cooperatives can find remedies to correct situations which are part of the aftermath of a disaster.

When there are major events, ECSC coordinates with the SCEMD liaison who takes the following actions:

Initial Actions During Events

- Request preliminary damage assessments (PDAs) from cooperatives
- Provide county thresholds and ongoing changes/inclusions to cooperatives
- Share declaration announcements and associated documentation with cooperatives
- Provide cooperative service information (counties served) to Emergency Support Function #14 (FEMA's Long-Term Community Recovery Annex)

- Share all other relative documentation when requested
- Field general FEMA questions and qualification requests from cooperatives

Actions after Events

- Continue with activities initiated during storms
- Coordinate an Applicant's Briefing in a convenient location for affected cooperatives, SCEMD Public Assistance authorities and FEMA representatives. May require multiple meetings.
- Mitigate conflicts that arise between cooperative personnel, SCEMD Public Assistance authorities, and FEMA representatives during the grants process. This mainly requires communication between affected parties and identifying and working through points of contention.
- Follow up with SCEMD Public Assistance authorities and FEMA personnel on behalf of cooperatives seeking grant closeout after an extended period of delay.

General Preparedness

- Coordinate cooperative-specific training with SCEMD Public Assistance authorities and FEMA representatives.
- When needed, seek guidance and/or assistance from NRECA concerning regional or national issues, such as FEMA procurement requirements.

4. Long Range Plans and Construction Work Plans – Resiliency Enhancements, Load Capacity, etc.

Periodically, the electric cooperatives analyze their systems from the standpoint of major and basic design needs to determine how well the existing facilities are meeting the present, and potential, needs of the systems. Of particular concern are facilities that are, or will be, beyond their useful life before the end of the planning period. Service reliability studies indicate areas of the systems that need special attention and may even indicate the general type of work that will be the most effective in correcting such service deficiencies. The results of the analysis and studies are compiled in Long Range Plans (LRPs). Planning for the future, including the potential for unprecedented events, is a continuous process. Data will continually be collected to verify the soundness of the existing plan and later to aid in preparing a new plan.

As a second tier of system planning, cooperatives develop Construction Work Plans (CWPs). The CWP process is used to determine and document the most feasible, environmentally acceptable, and economical construction required during the planning period (usually two to five years), which is needed to provide adequate and reliable electric service to all new and existing services. Cooperatives build CWPs based on RUS guidelines found in RUS Bulletin 1724D-101B. LRPs and CWPs include resiliency upgrades, such as the examples detailed in Section VII (Resiliency Solutions).

5. Staging of Resources and Critical Replacement Materials

Central and NHEC utilize CEE-US to source most commonly used pole hardware for damage incurred in the DEC BAA area of Central's system, and Central maintains a pole inventory in various locations within the state to supply replacement steel poles for any structures damaged.

Santee Cooper maintains adequate inventory and relies on strategic sourcing to supply replacement material for repairs to these at-risk items in the Santee Cooper BAA.

6. Curtailment/Interruption Protocols

Curtailment of service and interruption protocols are the responsibility of the BAA operators (Santee Cooper and Duke). Central's radial fed transmission system is impacted by a rolling blackout scenario, and Central has no recourse to affect the duration or frequency of such protocols the BAA has in place and employs. Curtailment and interruptions based upon the stability of the overall electric grid take precedence over individual loads and are made by the BAA operators as a last resort to preserve electric system stability. Central understands the need for such protocols and supports the BAA operators in the implementation of such protocols when necessary. It should be noted, however, that Central's power providers have a contractual obligation to Central to implement curtailments without regard to whether the ultimate consumer is directly or indirectly (through Central) served by the provider.

7. Systematic Approach to Restoration

Electric cooperative operations and engineering personnel know where critical loads are located and will prioritize service restoration to those areas; however, during restoration after a service interruption, the goal is to get as many member-consumers online as fast as possible. That means restoring substations (after any lost transmission is restored), then mainline feeder, then taps, and lastly services to homes/businesses. Restoration priorities are established during the emergency action planning process.

X. **BEST PRACTICES, LESSONS LEARNED, CHALLENGES**

Central and its Member electric cooperatives have implemented a number of strategies based on past weather events.

A. **Past Events and Lessons Learned**

- Almost all of Central's transmission facilities have conductors installed that meet or exceed the load current they are subject to. Routine cold weather has not affected Central's system reliability.
- Central's member systems have developed an effective, wide ranging social media communications program, the most visible of which is the "Beat the Peak" program. In the event of a severe winter storm, such communications are employed as part of overall peak load management.
- Central's demand charge to its twenty member cooperatives is on the monthly BAA coincident peak load (the highest one-hour load during each month). Load management and other demand response actions are incentivized to take action across the highest peaks in the month. As the winter load shape is "peaky," such a price signal is helpful from the standpoint of focusing attention on high peak demands.
- While weather events affect the level of the daily load shape, the shape itself has remained relatively stable and predictable over time. Central's 24-hour winter load shape is relatively stable reflecting consistent consumer behavior. Central knows, for example, that its weekday peak almost always occurs on the hour from 7:00-8:00 a.m. and that its weekend peak occurs a few hours later than that. This information is of great value when optimizing a set of resources. For example, natural gas nominations need to be made the previous day

in anticipation of a morning peak. Additionally, the output from renewable solar resources can be reasonably known and planned in advance.

- Central learned from the 2020 Tornado that there is a need to maintain pole inventory, in addition to the inventory that Santee Cooper keeps.
- Co-ops continue to learn and improve.
 - Pre storm staging and coordination
 - Documentation to support FEMA
 - Improved access to key facilities

B. South Carolina Contrast and Lessons Learned from the February 2021 Winter Weather Event in TX / Southwest

- Weather Event Likelihood – The areas affected the most by the February Event recorded record winter weather conditions. Similar events had occurred in the not-so-distant past, however, not to the same extreme. Many of the lessons learned of the past were not effectively deployed as a response and that resulted in a more severe situation in February 2021. While, it is not clear whether extreme winter weather is more or less likely for the state of South Carolina, it is clear that all utilities across the country should take seriously the lessons learned from the February event.
- Resource Mix – The entire US electric grid is relying more and more on natural gas-fired generation plants with the demise of coal. The natural gas generation lost within ERCOT during February 2021 represented approximately $\frac{1}{2}$ of the total generation lost, and wind represented $\frac{1}{3}$ of the total generation lost. Currently, South Carolina has more capacity reserves than what is found in ERCOT. Specifically, South Carolina's resource portfolio

of non-natural gas and non-renewable resources, which are less susceptible to extreme winter weather, are much higher than those found in ERCOT and the surrounding areas. However, in reviewing South Carolina-based IRPs, coal retirements will in some portion be replaced by natural gas-fired generation sources or renewables that have a higher susceptibility to the issues that occurred during February 2021. Implementation of preparedness and mitigation measures are important to mitigate those risks.

- **ERCOT Is Unique** – The February 2021 event was most clearly not specific to a particular region of the Country. However, some regions weathered the storm better than others. Because of ERCOT’s limited connectivity to surrounding states, it was unable to take advantage of generating resources or capacity that bordered the state and which could have lessened the impacts of the event. South Carolina on the other hand, and specifically the Santee Cooper and Duke BAAs, are tied to neighboring states and wholesale power supply resources all over the Southeast and along the East Coast. ERCOT functions as an Energy Only Market which incentivizes participants to focus on energy, not the assurance of secure resource capacity. South Carolina’s bilateral wholesale power market and associated regulatory environment does not enjoy the fluidity of a true market, but that also means it is not susceptible to the associated unintended consequences and typically a more robust supply of capacity reserves.
- **Load Curtailment** – The February 2021 event was exacerbated by two components of the load curtailment process.
 - **Critical Load Identification** – Natural gas processing plants and pipeline compressor stations were not properly identified as critical infrastructure. As a result, natural gas generation that otherwise may have been functional was forced

to outage as natural gas supply was unavailable. All utilities should regularly and carefully identify and document all critical loads, some of which may need to fluctuate depending upon the type of event that the grid faces.

- Curtailment Granularity - The circuits-based curtailment process did not possess the degree of granularity necessary for such a wide-scale event. Utilities should begin utilizing the technology that currently exists and will exist in the future, along with a sharpened identification of critical infrastructure, to curtail load more granularly and effectively in the event of a crisis.
- Mitigation Considerations:
 - Contemplate adding (a) firm transportation in the winter, (b) oil backup, or (c) gas storage to support NG generators.
 - Review the firmness of fuel arrangements for capacity accreditation purposes.
 - Encourage power suppliers to consider additional weatherization for most at-risk generating resources based on a cost-benefit analysis.
 - Consider strategic deployment of certain resources (specifically gas units) at minimum load when severe winter weather is projected to assure that there is not a freeze up or cold start failure.

XI. CONCLUSION

Once again, the cooperatives appreciate the opportunity to provide comments to the Commission and ORS in this proceeding and look forward to participating further in this effort to

ensure that South Carolina energy providers are adequately prepared to meet and respond to extreme winter weather events. We welcome comments and feedback from stakeholders.

Three of the guiding principles of the cooperative form of organization are cooperation (not surprisingly); education, training and information; and concern for community. This proceeding provides all South Carolina electric service providers valuable opportunities for self-reflection and inter-utility information sharing, which can only serve to foster improvement in our preparation for and response to extreme winter weather scenarios. The ultimate beneficiaries of this proceeding will be the citizens of South Carolina, our member-owners and constituents, and we hope that the lessons learned from this exercise will contribute to improving quality of life for all South Carolinians.

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